

# Are Non-Practicing Entities Opportunistic? Evidence from Litigation of Standard Essential Patents\*

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## ABSTRACT

*Are non-practicing entities (NPEs) more likely than other patent enforcers to behave opportunistically? To explore this question, we construct measures of opportunistic conduct by patent enforcers and document the presence or absence of these behaviors in a subset of U.S. patent cases in which opportunism is especially likely to occur: cases that assert standard essential patents (SEPs). Our results suggest heterogeneity across different opportunistic behaviors. NPEs are more likely to exploit the SEP-declaration process and the SEP market's lack of transparency, while practicing entities (PEs) are more likely to exploit potential licensees' position in the supply chain and to pursue bans on the sale and importation of their products. We additionally present evidence that opportunism can affect case outcomes. Declaration- and market-related opportunism are associated with a higher rate of settlement in NPE cases and a lower rate of settlement in PE cases.*

**KEYWORDS:** Litigation, standards, patents, non-practicing entities, U.S.

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# 1 Introduction

Do “non-practicing entities” (NPEs)—i.e., firms that specialize in the enforcement of patent rights rather than the commercialization of patented technologies—have a net positive or negative impact on innovation? In the last two decades, no single question has proven more controversial or consequential in the realm of U.S. patent law and policy. Remarkably, almost every major development in U.S. patent law since the early 2000s—restrictions on injunctive relief, patentable subject matter, and venue, as well as the expansion of administrative patent challenges, nonobviousness, and fee shifting—can be traced directly to concerns about the prevalence and potential negative effects of patent enforcement by NPEs.<sup>1</sup> At the same time, opponents of these and other attempted reforms argue that NPEs are no more problematic than any other patent enforcer and, indeed, commonly play an important role in the innovation ecosystem.<sup>2</sup>

This split of opinion in patent policy circles mirrors a similar dichotomy in the theoretical literature. On one hand, theory shows that NPEs can increase incentives to innovate by serving inventors who lack the resources or expertise necessary to license valuable technology to firms that wish to utilize it (Bergin, 2022; Lemus and Temnyalov, 2017; Hagiu and Yoffie, 2013; McDonough III, 2006). In this context, NPEs play the role of efficiency-enhancing “intermediaries” or “market makers” that enable innovators to capture well-deserved rents they otherwise might be forced to forego. On the other hand, theory likewise shows that NPEs can opportunistically exploit weaknesses in the patent system to extract excessive licensing fees from innovative firms producing successful products and services (Abrams et al., 2019; Cohen et al., 2019; Lemley and Melamed, 2013). In this context, NPEs function as innovation-hampering “patent trolls” or “stick-up artists” that use “hold-up” tactics to extract undeserved rents from those engaged in genuine innovation.

Because both characterizations of NPEs are valid in principle, determining which behavior predominates in practice is fundamentally an empirical question. Empirical analysis of NPEs has, to date, primarily focused on the effect that NPE lawsuits have on those firms accused of infringement.<sup>3</sup> Multiple studies show that NPE suits negatively impact targeted firms’ stock

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<sup>1</sup>See, e.g., Adam Liptak, [Supreme Court Considers Why Patent Trolls Love Texas](#), New York Times (March 27, 2017); Michael A. Sartori, Adam Hess, & Trent Ostler, [Supreme Court Aiding Fight Against Patent Trolls: Alice, Nautilus, Limelight, Octane Fitness and Highmark](#), Mondaq (July 1, 2014); Hilda C. Galvan, [New Legislation Helps in the Fight Against Patent Trolls](#), American Bar Association (August 27, 2013); Keith L. Slenkovich, [U.S. Supreme Court Decisions in ebay, Medimmune, and KSR Deliver Triple Dose of Bad News to Non-Practicing Patent Holders \(AKA “Patent Trolls”\)](#), Mondaq (September 7, 2007).

<sup>2</sup>See, for example, Paul Stewart, [Hostile IP Environment for Inventors Could Hamper US Innovation](#), Bloomberg (Jan. 6, 2023); Stephen Haber and Ross Levine, [The Myth of the Wicked Patent Troll](#), Hoover Institution (June 29, 2014); Erin Mershon, [Patent Warfare: Trolls vs. Inventors](#), Politico (Dec. 12, 2013).

<sup>3</sup>For an overview of the literature, including the shortcomings of many contributions, see Cohen et al. (2017).

prices, sales, and subsequent investments in related R&D (Cohen et al., 2019, 2016; Bessen and Meurer, 2014; Tucker, 2014). While many have concluded from these studies that NPEs have an overall negative effect, others contend that their findings are incomplete because they do not fully account for NPEs' potential to indirectly encourage innovation at other firms. While the literature provides at least some reason to doubt that such an effect is large,<sup>4</sup> widespread confidentiality in the market for patent rights means that little is known about the fraction of NPE revenue that flows back to the inventors of asserted patents (Schwartz and Kesan, 2014). Nor is it known how much, if at all, the existence of NPEs deters infringement generally and, if so, to what extent this may also increase incentives to innovate.

In this paper, we contribute to the empirical literature on NPE behavior by presenting direct, comparable evidence of opportunistic behaviors by NPEs and operating companies (i.e., practicing entities, or PEs) in the context of enforcing standard-essential patents (SEPs). Specifically, we identify all U.S. patent suits filed 2010-2019 to enforce declared SEPs, construct measures of opportunistic behavior by SEP licensors, code these measures using detailed information collected from case dockets, and compare the relative prevalence of opportunistic behavior by NPE and PE licensors.

Relative to the existing literature, our approach has several key advantages. First, our approach produces results that allow NPE behavior to be judged relative to the behavior of similarly situated PEs. In particular, our focus on SEP litigation ensures that all cases included in our analysis concern well-defined technologies, uniformly implemented in similar products. In addition, our setting is unique in that the overwhelming majority of NPE-asserted patents were originally held by large, operating technology companies that plainly possess the resources and expertise necessary to enforce those patents on their own. Indeed, many of these companies *did* enforce SEPs in parallel with those transferred to NPEs (below we refer to a PE and the NPE to which it sold SEPs as a "transacting PE-NPE pair").<sup>5</sup> Accordingly, a comparison of NPE and PE litigation behaviors in our context provides a degree of insight into the characteristics of the possible counterfactual assertions that may have taken place but for the option to transfer certain patents to NPEs. This, in turn, may also shed light on the reasons why operating companies with a great deal of in-house patent expertise nonetheless routinely transfer patents to NPEs.

A second advantage of our approach is that by directly measuring opportunism we avoid

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<sup>4</sup>Bessen and Meurer (2014) estimate that only about 5% of revenues earned by 10 publicly traded NPEs passed through to asserted patents' original owners, though significantly more (15%) was devoted to these NPEs' own R&D. In addition, survey evidence collected by Robin (2014) and Feldman and Lemley (2015) suggests that NPE patent assertion neither incentivizes the formation of new venture-backed firms nor leads to the transfer of technology to firms that are sued, though experimental evidence produced by Haber and Werfel (2016) suggests that NPEs may be most important for especially small innovators.

<sup>5</sup>NPEs in our sample acquired SEPs from, among others, Nokia, Ericsson, Panasonic, and LG—all of which also filed SEP enforcement actions of their own.

significant challenges inherent in attempting to measure instead *the results* of opportunistic behavior, such as excessive royalty payments or detrimental effects on innovation incentives. Studies that attempt to determine whether NPEs are able to achieve court awards and litigation settlements disproportionate to the value of the patent rights they hold (FTC, 2016; Mazzeo et al., 2013) are frustrated by the high settlement rate of patent litigation and the notoriously opaque nature of the patent licensing market (Love and Helmers, 2022; Hagiu and Yoffie, 2013). In addition to concerns about the quantity and representative nature of available patent damages and licensing data (Masur, 2015), it can be unclear by what standard a licensing request or negotiated rate may be judged “excessive” in a market that exhibits low price transparency and high price dispersion. Our approach benefits from the public nature of U.S. court filings, which allows us to code measures of opportunism for our entire sample of SEP litigation. In addition, there is good reason to believe that opportunistic conduct is relatively likely to both take place and be observed in our setting. For one, theory predicts that incentives for opportunistic conduct are particularly strong in the context and SEP licensing (see for example, Shapiro, 2001; Lemley and Shapiro, 2007). Moreover, the availability of antitrust counterclaims in the context of SEP litigation suggests that opportunistic behavior is particularly likely to be documented in court filings.

A final (related) advantage of our approach is the fact that SEP litigation makes opportunistic behavior relatively easy to define and quantify. While others have attempted to measure NPE opportunism by studying the “quality” of the patents that NPEs hold (Feng and Jaravel, 2020; Fischer and Henkel, 2012) and the characteristics of the defendants they sue (Cohen et al., 2019), these metrics may lend themselves to multiple interpretations, not all of which are consistent with opportunistic behavior.<sup>6</sup> By contrast, our setting benefits from the fact that declared SEPs must be licensed on “fair, reasonable, and nondiscriminatory” (FRAND) terms, and while the precise contours of SEP licensors’ FRAND commitments are the subject of great debate, many observable behaviors are widely regarded by courts and competition law regulators as suspect in the context of SEP licensing.

Overall, our results suggest heterogeneity across different opportunistic behaviors that arise in the SEP licensing context. In particular, we present evidence that NPEs are more likely to take advantage of opportunism in the patent-declaration process, as well as to embrace strategies that leverage the SEP market’s lack of transparency. At the same time, our results suggest that PEs are more likely to strategically leverage supply chain dynamics when licensing SEPs, as well as to pursue bans on the sale and importation of alleged infringers’ products.<sup>7</sup> Our

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<sup>6</sup>Many metrics of patent quality—particularly, citation counts—are plausibly consistent with both technological importance and excessive claim breadth (Abrams et al., 2018). Sichelman (2014) provides a critique of several defendant-focused measures of NPE opportunism.

<sup>7</sup>As explained in greater detail below, this result likely reflects to some extent the fact that NPEs are unlikely to obtain injunctive relief or exclusion orders in the U.S.

results remain heterogeneous across behaviors when we limit our sample to transacting PE-NPE pairs, as well as when we compare PE behavior with the behavior of NPEs of different types. While much has been made in the literature about distinctions among NPE types (Cotropia et al., 2014; Lemley and Melamed, 2013), our core results hold—and, indeed, are remarkably consistent—regardless of the origin of NPEs' SEPs.

We additionally analyze the association between opportunistic conduct and case outcomes in the form of settlement. Here, we find that, while opportunism in PE cases is associated with a lower rate of settlement, this is not so when we focus on the sample of NPE suits. Overall, we find that NPE assertions of strategically declared SEPs are significantly more likely to settle, as are NPE assertions that strategically leverage the SEP licensing market's opaqueness. Considered in combination with the results reported above, these findings are consistent with the oft-stated hypothesis that NPEs prefer to settle the cases that they file and pursue relatively more often those forms of opportunistic conduct that tend to induce settlement. That said, performing this analysis with our subset of PE-NPE pairs fails to produce significant results for the NPE interaction term.

Finally, and more generally, our results highlight the significant role that NPEs play in the SEP licensing ecosystem. Given that large technology companies typically control the standard development process, it is surprising that NPEs account for more than two-thirds of all declared SEP assertions initiated during the period of our study. As our results document, the majority of SEP litigation is initiated not by established market participants, but instead by NPEs to which they sold patents. These findings, particularly when considered in combination with our opportunism-related results, contribute to the literature on so-called "patent privateering" (Rubinfeld, 2018; Ewing, 2015), which posits that operating technology companies transfer patents to NPEs at least in part to exploit the latter's relative ability to engage in opportunistic conduct targeting the former's competitors.

## **2 Opportunism in SEP Licensing**

The advantageous nature of our setting derives from unique characteristics of the SEP licensing ecosystem. Because technology standards are developed through cooperative procedures that incorporate input from industry incumbents, their adoption naturally introduces some risk of exclusionary conduct, particularly when those who define a standard hold corresponding patent rights that could be asserted against future market entrants and competitors that did not participate in the standard-setting process. To mitigate the anti-competitive potential of their members' standard-related patent holdings, standard-setting organizations (SSOs) typically require as a condition of participating in the standard development process that firms

commit to (i) publicly disclose (or “declare”) any patent rights they hold that cover technology incorporated into the relevant standard and (ii) license those patents on “fair, reasonable, and non-discriminatory” terms that ensure the relevant standards can be widely adopted by current and future market participants.

While both requirements are simple enough to articulate and justify in principle, there remains strong disagreement in practice as to precisely what conduct these commitments allow and prohibit. Nonetheless, both the literature and policymakers recognize a number of SEP licensing strategies that straddle the line and at least occasionally cross it in violation of competition law and/or legally binding commitments made to SSOs. Our analysis incorporates eleven such opportunistic behaviors, which we group in four broad categories.

## 2.1 Declaration-Related Gamesmanship

We begin with two strategic behaviors that push the boundaries of SEP holders’ patent declaration obligations. First, before a standard is finalized and widely adopted, SEP holders have incentive to opportunistically delay the declaration of essential patent rights. Among other possible advantages of this tactic, delayed declarations can induce inclusion of the relevant technology in the relevant standard, as well as adoption of the relevant standard by market participants, by obscuring the degree to which the technology and standard are protected by patents that must be licensed to lawfully implement the standard. Relatedly, once a standard is finalized and widely adopted, SEP holders have incentive to obtain and declare as essential as many future patents as possible, including by opportunistically expanding existing patent families through continuation practice (Righi and Simcoe, 2020) or declaring as essential patents that, properly interpreted, do not actually read on the standard (Lemley and Simcoe, 2019).<sup>8</sup> Both behaviors—which we refer to, respectively, as *untimely declaration* and *overdeclaration* of SEPs—facilitate a form of “hold-up” in which firms that irrevocably invest in implementing a given standard with an initial understanding of the licensing costs involved can later be “ambushed” with additional demands that still more patents be licensed.<sup>9</sup>

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<sup>8</sup>In addition to the fact that future declarations may require implementers to extend the duration of earlier licensing agreements, an SEP licensor’s share of the total pool of SEPs declared essential to a given standard can directly affect the amount of royalties it is awarded in an enforcement action under the so-called “top down” approach to calculating damages in SEP cases.

<sup>9</sup>For an example of antitrust enforcement against “patent ambush” see *Rambus, Inc. v. FTC*, 522 F.3d 456 (D.C. Cir. 2008).

## 2.2 Exploiting the Supply Chain

A second set of strategies, which skirt at least the “non-discriminatory” aspect of FRAND licensing commitments, are made possible by the lack of complete vertical integration among technology firms. Because standards implementation is typically carried out by components (such as chipsets or modules) that are incorporated into larger end products, SEPs (if valid and truly essential) are commonly infringed by multiple firms along the supply chain. This fact opens the door for a number of related opportunistic behaviors.

For one, SEP licensors can strategically elect to target downstream firms for license demands. Relative to upstream component manufacturers, downstream firms sell larger products at higher price points and, moreover, are often less familiar with the technical details of the standard and the standard-compliant component. While in theory the same royalty can be calculated by applying both a relatively small rate to a relatively large base and a relatively large rate to a relatively small base, patent owners in practice are likely to recover more in damages (at least in the U.S. legal system) when they sue firms that sell end products.<sup>10</sup> In response to these concerns and in recognition of the long-standing requirement that patent damages be properly “apportioned” to cover only the patented technology at issue in the case,<sup>11</sup> U.S. courts have ruled that reasonable royalty damages should ordinarily be calculated using the “smallest salable patent-practicing unit” (SSPPU) in an accused multi-component product as the royalty base, rather than the price of the end product under the so-called “entire market value rule” (EMVR).<sup>12</sup> In the analysis below, we capture improper reliance on end-product prices in the calculation of royalties in a measure called *EMVR vs. SSPPU*.

In addition to strategically targeting downstream firms that earn the most revenue, licensors can make licensing demands from companies at *multiple* levels of the supply chain. While in principle patent rights are said to “exhaust” once one level of the supply chain is licensed,<sup>13</sup> SEP licensors with large portfolios and complex, confidential licensing histories can attempt to “double dip” by seeking overlapping royalties from firms at different levels of the supply

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<sup>10</sup>See Chao (2012) at pp. 119-25, 134-38 for a summary of the relevant literature. *See also LaserDynamics, Inc. v. Quanta Comp., Inc.*, 694 F.3d 51, 68 (Fed. Cir. 2012) (“Admission of . . . overall revenues, which have no demonstrated correlation to the value of the patented feature alone, only serve to make a patentee’s proffered damages amount appear modest by comparison, and to artificially inflate the jury’s damages calculation beyond that which is ‘adequate to compensate for the infringement.’”). In addition, the widespread existence of indemnity clauses in supply contracts may skew downstream firms’ incentives to defend infringement claims since they may be able to pass royalty costs upstream to their vendors.

<sup>11</sup>*See Garretson v. Clark*, 111 U.S. 120, 121 (1884) (“The patentee . . . must in every case give evidence tending to separate or apportion . . . the patentee’s damages between the patented feature and the unpatented features.”).

<sup>12</sup>*See, e.g., VirnetX, Inc. v. Apple Inc.*, 767 F.3d 1308 (Fed. Cir. 2014); *LaserDynamics*, 694 F.3d at 67 (“[I]t is generally required that royalties be based not on the entire product, but instead on the ‘smallest salable patent-practicing unit.’”).

<sup>13</sup>*See Impression Prods., Inc. v. Lexmark Int’l, Inc.*, 137 S.Ct. 1523 (2017).

chain. Relatedly, licensors can increase pressure by pitting firms at different supply chain levels against one another; for example, by threatening to sue the customers of a potential licensee that has not accepted a licensing demand. We refer to these opportunistic behaviors as *exhaustion avoidance* and *threats to sue customers*, respectively.

### 2.3 Leveraging Informational Asymmetries

A third category of opportunistic conduct exploits informational advantages resulting from the lack of a (thick) market for pricing SEP licenses. First, the market's lack of transparency facilitates discriminatory and exclusionary licensing practices by obscuring variation in license terms (and effects<sup>14</sup>) across individual licensees or market segments. In such a setting, SEP licensors may (despite FRAND commitments) engage in price discrimination and other opportunistic pricing strategies. We refer to this kind of exclusionary conduct as *discriminatory licensing*.

At a more granular level, informational asymmetries additionally facilitate the selective revelation and suppression of prior licenses in support of excessive royalty or damages requests. While it is a common practice in litigation to reference existing "comparable" licenses in calculating a reasonable royalty, the extent to which any given license is truly "comparable" is often controversial due to differences in the patents, duration, geographic regions, and other factors involved. This provides the opportunity for SEP enforcers to rely on existing licensing agreements that result in more favorable royalty calculations than what would result if all relevant differences were known and accounted for. We refer to an SEP holder's attempt to justify a royalty demand by reference to misleading licensing data as *prior licenses not comparable*. Further, an SEP licensor advancing an excessive royalty request may opportunistically refuse or delay the disclosure of relevant prior licenses, including by nominally agreeing to provide the information while placing conditions on the receipt of such information that no reasonable licensee would accept, in hopes that the prospective licensee will agree to terms before any unfavorable information is revealed. We refer to this tactic as *no disclosure*.

### 2.4 Sales Bans

Finally, despite committing to license their patent rights on FRAND terms, SEP holders may nonetheless pursue (or threaten to pursue) injunctive relief, just as they would if asserting

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<sup>14</sup>In principle, even facially neutral licensing terms can have disparate, potentially exclusionary effects across licensees. For example, a consistent royalty rate applied to each standard-compliant product can lead to royalties that vary greatly across market segments (and opportunistically capture value attributable to features and components completely unrelated to the standard). Similarly, a flat dollar-value-per-unit royalty can be opportunistically set at levels that some competitors cannot afford to pay.



non-essential patents. A sizeable theoretical literature explores the effect of injunctions on incentives to settle patent cases and license patent rights (e.g. Shapiro, 2010), and in recent years courts, antitrust authorities, and even SSOs have called into question whether injunctive relief is an appropriate remedy in SEP litigation.<sup>15</sup> We capture SEP enforcers' assertion of entitlement to an injunction in a measure called *injunction*. In addition to requesting injunctive relief in U.S. district courts, SEP holders may also pursue an importation ban, or "exclusion order," in administrative litigation before the U.S. International Trade Commission (ITC). If an SEP holder initiates an ITC investigation in parallel with a district court case, we refer to this as *parallel ITC litigation*. Further, an SEP holder may pursue an injunction in parallel litigation filed in another country. Particularly if the parties' dispute arises from negotiation of a global SEP license, the prospect of a sales ban in a major foreign market can affect licensing negotiations in the U.S.<sup>16</sup> We refer to suit in an injunction-friendly foreign jurisdiction as *relevant litigation abroad*.

### 3 Data

Our core data are U.S. patent suits filed 2010 to 2019 to enforce one or more declared SEPs subject to a FRAND-licensing commitment. We construct this data by merging U.S. patent litigation data sourced from the MaxVal Patent Litigation Databank<sup>17</sup> with the Searle Center Database on Technology Standards and Standard Setting Organizations, which includes 139,620 patents declared essential to one or more standards developed by 16 SSOs and patent pools, including ETSI, IEEE, and ITU (Baron and Spulber, 2018; Baron and Pohlmann, 2018).<sup>18</sup>

For all cases identified as involving at least one declared SEP, we collect additional party-, case-, and patent-party-case-level data. First, using data obtained from [RPX Insight](#) and the [Stanford NPE database](#), we categorize each patent enforcer as an operating technology

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<sup>15</sup>For a summary of relevant case law and policy statements, see, e.g., [United States: SEPs and FRAND à Litigation, Policy and Latest Developments](#) (Global Competition Review, Dec. 2, 2022); [Injunctive Relief for SEPs Subject to FRAND](#), in *Patent Challenges for Standard-Setting in the Global Economy: Lessons from Information and Communications Technology* (2013).

<sup>16</sup>See *Microsoft Corp. v. Motorola, Inc.*, 696 F.3d 872, 886 (9th Cir. 2012) (holding that the district court did not abuse its discretion in concluding that Motorola's parallel SEP suit in Germany was "vexatious and oppressive" because the foreign suit was "designed to harass Microsoft with the threat of an injunction removing its products from a significant European market and so to interfere with the court's ability to decide the contractual questions already properly before it"); 795 F.3d 1024, 1032 (9th Cir. 2015) (noting that Motorola's "German action was particularly threatening to Microsoft, as its European distribution center for all Windows and Xbox products was in Germany").

<sup>17</sup><https://www.maxval.com/litigation-databank/>

<sup>18</sup>Because the declaration of a single patent is generally regarded as a declaration of the patent's entire family, we used EPO's Patstat database to identify all issued members of each declared patent's family.

company (i.e., a “practicing entity” (PE)) or a “non-practicing entity” (NPEs), and additionally classify each NPE as one of the following NPE types: (i) an entity enforcing patents acquired on the secondary market (acquired-type), (ii) a previously operating technology company that transitioned to monetizing its patent portfolio (failed company-type), (iii) an entity controlled by the individual(s) who invented the asserted patent(s) (individual controlled-type), and (iv) an entity that files and prosecutes its own patent applications for the purposes of licensing and assertion, rather than to facilitate its own commercialization of the underlying inventions (in-house-type). In addition, using USPTO patent assignment records, we identify the source of each SEP enforced by each acquired-type NPE and classify each source as one of the following: (i) an operating company, (ii) a failed operating company, (iii) another (independent<sup>19</sup>) NPE, or (iv) a defensive patent aggregator (in all instances, [Allied Security Trust](#)).

As specified in greater detail in Appendix A, we additionally construct a number of variables that allow us to control for litigants’ characteristics and relationship. For each unique accused infringer-SEP combination, we also determine when and how the claim of infringement terminated, including whether the claim was settled or decided (at least in part) on the merits. These data track each individual patent-party combination across intervening transfers, severances, and re-filings.

Finally, we code measures of the opportunistic behaviors described above using data collected from case dockets and filings, which we search using [Docket Navigator](#). As specified in much greater detail in Love et al. (2023), we review all pleadings, motions, and rulings filed in each case to identify whether each behavior is (when possible) directly documented or otherwise alleged to have been attempted with specific, factual support provided.

## 4 Results

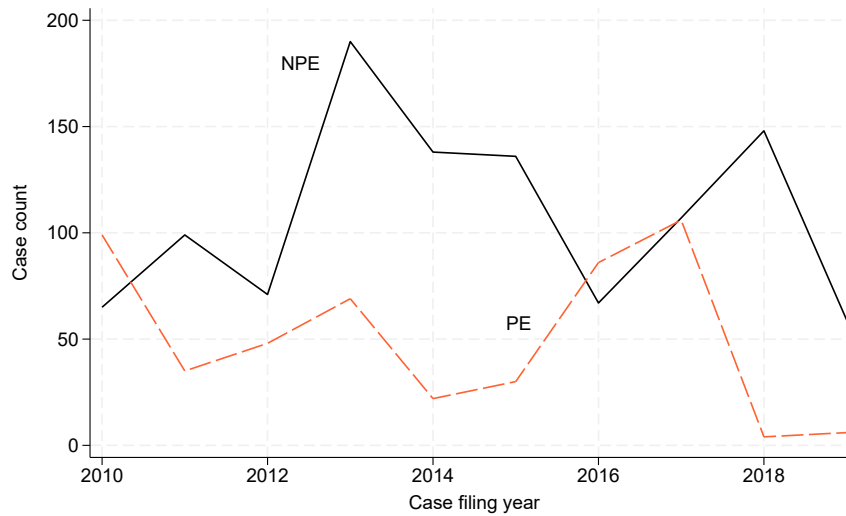
We begin with a descriptive look at the composition and characteristics of declared SEP assertions during the period of our study. Figure 1 presents the annual breakdown of SEP assertions by NPEs and PEs. While relatively few NPEs participate in the standard-setting process, we find that NPEs account for the majority of assertions in eight of the ten years covered by our data and, overall, account for more than two-thirds of patent-party level assertions. As shown in Figure 2, the overwhelming majority of NPE assertions of declared SEPs are brought by NPEs that acquired those patents on the secondary market and, in turn, the overwhelming majority of acquired patents were acquired from operating technology

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<sup>19</sup>We ignore transfers among related NPE subsidiaries.

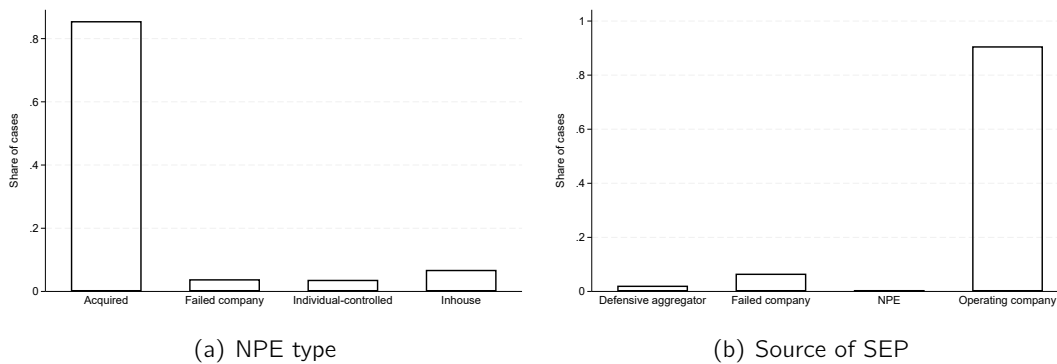
companies.<sup>20</sup>

Figure 1: SEP district court cases by plaintiff type 2010-2019



PE: practicing entity; NPE: non-practicing entity. Unit of observation at the patent-party-case level.

Figure 2: NPE type and source of acquired patents



Notes: Figure (a) shows the number of share cases by NPE type. Figure (b) shows the share of cases by source of patents enforced by NPEs.

Table 1 provides a simple comparison of the relative rates at which NPE and PE SEP case dockets reveal evidence of the eleven measures of opportunistic conduct defined above. Columns (1), (2), and (3) present results for our full sample, while columns (4), (5), and (6) present results when we restrict our sample to the assertions of transacting PE-NPE pairs—i.e., the assertions of PEs that sold SEPs to NPEs and the assertions of the NPEs to which

<sup>20</sup>Table A-1 in the online appendix shows the ten most active NPEs in our sample. Acacia, a large publicly traded NPE, is the most active acquired-type NPE. FastVDO, a company founded in 1998, Helferich Patent Licensing, an NPE controlled by inventor Richard Helferich, and WiLAN (owned by Quarterhill during our sample period), a Canadian NPE that licenses wireless communication technology, are respectively the most active failed-type NPE, individual-controlled-type NPE, and in-house-type NPE in our sample.

those SEPs were transferred.<sup>21</sup> Interestingly, despite the literature’s common association of NPEs with “troll”-like behavior, we find evidence of opportunistic behavior significantly less often in the context of NPE SEP assertion. In fact, we find in both samples that NPEs are on average significantly more likely than PEs to be accused of just one opportunistic behavior: *untimely declaration*, the opportunistic enforcement of patents that, despite being filed earlier, were not declared essential until after the relevant standard’s completion.

Table 1: Opportunistic behavior by SEP status

| Opportunistic behavior            | All   |       |           | PE-NPE pairs |       |           |
|-----------------------------------|-------|-------|-----------|--------------|-------|-----------|
|                                   | NPE   | PE    | Diff.     | NPE          | PE    | Diff.     |
|                                   | (1)   | (2)   | (3)       | (4)          | (5)   | (6)       |
| 1 <b>Declaration</b>              | 25.09 | 33.66 | -8.57***  | 45.92        | 39.45 | 6.46*     |
| 1.1 Untimely declaration          | 23.24 | 11.28 | 11.95***  | 44.05        | 9.37  | 34.68***  |
| 1.2 Overdeclaration               | 2.96  | 25.54 | -22.58*** | 2.79         | 31.64 | -28.84*** |
| 2 <b>Supply chain</b>             | 27.50 | 49.50 | -22.00*** | 36.82        | 56.64 | -19.81*** |
| 2.1 EMVR vs. SSPPU                | 8.61  | 22.57 | -13.96*** | 10.72        | 31.64 | -20.91*** |
| 2.2 Exhaustion avoidance          | 19.16 | 34.25 | -15.09*** | 26.80        | 30.85 | -4.05     |
| 2.3 Threats to sue customers      | 1.11  | 2.77  | -1.66**   | 2.33         | 1.95  | 0.37      |
| 3 <b>Market transparency</b>      | 10.83 | 34.25 | -23.42*** | 8.15         | 51.17 | -43.01*** |
| 3.1 Discriminatory license        | 4.16  | 19.40 | -15.23*** | 0.69         | 25.39 | -24.69*** |
| 3.2 Prior licenses not comparable | 6.20  | 14.05 | -7.85***  | 7.45         | 23.04 | -15.58*** |
| 3.3 No disclosure                 | 0.74  | 1.78  | -1.04*    | 0.69         | 2.73  | -2.03**   |
| 4 <b>Sales ban</b>                | 43.88 | 58.61 | -14.72*** | 13.75        | 51.95 | -38.20*** |
| 4.1 Injunction                    | 43.42 | 55.24 | -11.82*** | 13.75        | 48.43 | -34.68*** |
| 4.2 Parallel ITC litigation       | 4.35  | 6.73  | -2.38**   | 0            | 6.25  | -6.25***  |
| 4.3 Relevant litigation abroad    | 0.46  | 3.16  | -2.70***  | 0            | 4.29  | -4.29***  |
| Total cases                       | 1,080 | 505   |           | 429          | 256   |           |

Notes: PE: practicing entity; NPE: non-practicing entity. Unit of observation at the patent-party-case level. \* significant at 10%, \*\* at 5%, \*\*\* at 1%.

To more formally assess differences in the prevalence of opportunistic conduct among NPE and PE SEP enforcers, we estimate the following regressions:

$$opportunistic_i = \alpha + \beta NPE_i + \gamma X_i + \epsilon_i \quad (1)$$

where  $opportunistic_i$  is a measure of opportunistic conduct by the patent enforcer in patent-party-case combination  $i$ ;  $NPE_i$  is equal to one if that patent enforcer is an NPE;  $X_i$  is the list of patent, party, and case characteristics defined in Appendix A; and  $\beta$ , therefore, captures the differential effect of an SEP enforcer’s status as an NPE on the occurrence of opportunistic

<sup>21</sup>For example, this subset includes SEP assertions by Huawei and Inventery Global Inc., an NPE to which Huawei transferred the SEPs asserted by Inventery Global Inc.

conduct.

Table 2 presents the results obtained when we estimate this regression for each of the four summary measures listed in Table 1. The top panel presents results for our full sample, while the bottom panel presents results when we limit our sample to assertions by transacting PE-NPE pairs and include PE-NPE pair fixed effects. Controlling for a large number of observable patent, party, and case characteristics, we now see in both panels a significant, positive coefficient on the  $NPE_i$  dummy variable in two of four columns. In our complete sample, NPEs remain significantly less likely than PEs to engage in behaviors that leverage potential licensees' position on the supply chain (column (2)) and potential exclusion from the relevant market (column (4)), but are significantly more likely than PEs to attempt to exploit patents declared under questionable circumstances (column (1)) and the opaque nature of the SEP licensing market (column (3)).

In the bottom panel, which presents results based on a *within*-pair comparison of transacting PEs and NPEs, we find once more that NPEs are relatively more likely to enforce strategically declared SEPs and relatively less likely to pursue injunctions/exclusion orders. However, our results differ in that NPEs are now relatively more likely to attempt to exploit accused infringers' position on the supply chain and are neither significantly more nor less likely to attempt to leverage SEP market's lack of transparency. Though our data cannot say for sure, these differences may reflect that PEs in this subset are relatively more active in standard-supporting product markets and, thus, may be relatively more reluctant to sue downstream firms that are, or may become, their customers or business partners. SEP assertions by PEs in this subset may also be relatively more defensive in nature and, thus, (consistent with our data<sup>22</sup>) more likely to target direct competitors.

To investigate heterogeneity in opportunistic behavior across NPE types, we re-run the regressions defined above using separate dummy variables for each type of NPE (acquired, failed, individual controlled, and in-house). Corresponding results (calculated using our full sample<sup>23</sup>) are presented in Table 3. In contrast to the common suggestion in the literature that NPEs with different characteristics behave differently, our results are virtually uniform across NPE types. In column (2) we see that three of four NPE types are less likely to attempt to exploit licensees' position on the supply chain; individual-controlled NPEs, for which we do not find a significant coefficient in this column, are the exception. In all three other columns, our regression produces significant coefficients with uniform signs (positive in columns (1) and (3) and negative in column (4)) and comparable magnitudes.

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<sup>22</sup>70% of PE assertions in our subsample of PE-NPE pairs were brought against competitors, compared to just 54% of PE assertions in our full sample.

<sup>23</sup>We cannot analyze heterogeneity across NPE types in the subset of transacting PE-NPE pairs because all included NPEs are, by definition, acquired-type NPEs that obtained SEPs from operating technology companies.

Table 2: NPEs and opportunistic conduct

| <b>All</b>       | Declaration         | Supply chain         | Market transparency | Sales ban            |
|------------------|---------------------|----------------------|---------------------|----------------------|
|                  | (1)                 | (2)                  | (3)                 | (4)                  |
| NPE              | 0.434***<br>(0.052) | -0.378***<br>(0.062) | 0.300***<br>(0.049) | -0.828***<br>(0.068) |
| Controls         | Yes                 | Yes                  | Yes                 | Yes                  |
| Case filing year | Yes                 | Yes                  | Yes                 | Yes                  |
| R <sup>2</sup>   | 0.366               | 0.340                | 0.377               | 0.587                |
| Observations     | 1,585               | 1,585                | 1,585               | 1,585                |

| <b>PE-NPE pairs</b> | Declaration         | Supply chain       | Market transparency | Sales ban          |
|---------------------|---------------------|--------------------|---------------------|--------------------|
|                     | (1)                 | (2)                | (3)                 | (4)                |
| NPE                 | 3.443***<br>(0.654) | 2.556**<br>(0.762) | -1.006<br>(1.044)   | -2.276*<br>(1.130) |
| Controls            | Yes                 | Yes                | Yes                 | Yes                |
| Case filing year    | Yes                 | Yes                | Yes                 | Yes                |
| PE-NPE FE           | Yes                 | Yes                | Yes                 | Yes                |
| R <sup>2</sup>      | 0.589               | 0.409              | 0.642               | 0.735              |
| Observations        | 685                 | 685                | 685                 | 685                |

Notes: PE: practicing entity; NPE: non-practicing entity. Controls included listed in Appendix A. Unit of observation at the patent-party-case level. Standard errors clustered at (a) the patent-level in the upper-panel and (b) the PE-NPE pair level in the lower panel. \* significant at 10%, \*\* at 5%, \*\*\* at 1%.

Table 3: NPEs and opportunistic conduct by NPE type

|                  | Declaration         | Supply chain         | Market transparency | Sales ban            |
|------------------|---------------------|----------------------|---------------------|----------------------|
|                  | (1)                 | (2)                  | (3)                 | (4)                  |
| NPE (acquired)   | 0.432***<br>(0.061) | -0.354***<br>(0.063) | 0.300***<br>(0.053) | -0.914***<br>(0.067) |
| NPE (failed)     | 0.515***<br>(0.062) | -0.357***<br>(0.064) | 0.251***<br>(0.050) | -0.601***<br>(0.089) |
| NPE (indiv.)     | 0.412***<br>(0.085) | 0.084<br>(0.108)     | 0.219***<br>(0.070) | -0.552***<br>(0.100) |
| NPE (in-house)   | 0.347***<br>(0.091) | -0.435***<br>(0.078) | 0.337***<br>(0.060) | -0.468***<br>(0.101) |
| Controls         | Yes                 | Yes                  | Yes                 | Yes                  |
| Case filing year | Yes                 | Yes                  | Yes                 | Yes                  |
| R <sup>2</sup>   | 0.368               | 0.358                | 0.378               | 0.620                |
| Observations     | 1,585               | 1,585                | 1,585               | 1,585                |

Notes: NPE: non-practicing entity. Controls included listed in Appendix A. Unit of observation at the patent-party-case level. Standard errors clustered at the patent-level. \* significant at 10%, \*\* at 5%, \*\*\* at 1%.

To additionally investigate heterogeneity in opportunistic behavior across assertions of SEPs from different sources, we re-run the regressions in Table 3 while further distinguishing among asserted SEPs' prior owners. These results, presented below in Table 4, yet again suggest a high degree of homogeneity in the incidence of opportunistic behavior among NPEs, regardless of the source from which they purchased patents. As in Table 3 we see uniformly positive, significant results in columns (1) and (3) and uniformly negative, significant results in columns (2) and (4).

Finally, we consider whether opportunistic conduct affects case outcomes. We focus on settlement mainly because it is by far the most common outcome in patent litigation. In our data, we observe decisions on the merits in only slightly more than 5% of cases. We analyze the association between our measures of opportunistic conduct and settlement using the following specification:

$$settle_i = \alpha + \beta_1 NPE_i + \beta_2 opportunistic_i + \beta_3 NPE_i \times opportunistic_i + \gamma X_i + \epsilon_i \quad (2)$$

where the dependent variable  $settle_i$  is equal to one if case  $i$  settled, and all other variables are as defined in equation (1) above.

Table 5 reports the results obtained when we estimate the specification above. The top

Table 4: NPEs and opportunistic conduct by source of acquired patents

|                  |                      | Declaration         | Supply chain         | Market transparency | Sales ban            |
|------------------|----------------------|---------------------|----------------------|---------------------|----------------------|
|                  |                      | (1)                 | (2)                  | (3)                 | (4)                  |
| NPE (acquired)   | Patent source        |                     |                      |                     |                      |
|                  | Defensive aggregator | 0.442***<br>(0.081) | -0.520***<br>(0.097) | 0.445***<br>(0.071) | -0.633***<br>(0.094) |
|                  | Failed company       | 0.331***<br>(0.086) | -0.502***<br>(0.086) | 0.257***<br>(0.066) | -0.533***<br>(0.138) |
|                  | NPE                  | 0.297***<br>(0.077) | -0.947***<br>(0.078) | 0.362***<br>(0.072) | -1.450***<br>(0.085) |
|                  | Operating company    | 0.439***<br>(0.061) | -0.353***<br>(0.062) | 0.312***<br>(0.052) | -0.912***<br>(0.069) |
| NPE (failed)     |                      | 0.499***<br>(0.066) | -0.381***<br>(0.061) | 0.245***<br>(0.051) | -0.521***<br>(0.065) |
| NPE (indiv.)     |                      | 0.404***<br>(0.086) | 0.065<br>(0.111)     | 0.222***<br>(0.070) | -0.493***<br>(0.089) |
| NPE (in-house)   |                      | 0.340***<br>(0.091) | -0.448***<br>(0.079) | 0.338***<br>(0.061) | -0.416***<br>(0.088) |
| Controls         |                      | Yes                 | Yes                  | Yes                 | Yes                  |
| Case filing year |                      | Yes                 | Yes                  | Yes                 | Yes                  |
| R <sup>2</sup>   |                      | 0.370               | 0.366                | 0.380               | 0.643                |
| Observations     |                      | 1,585               | 1,585                | 1,585               | 1,585                |

Notes: NPE: non-practicing entity. Controls included listed in Appendix A. Unit of observation at the patent-party-case level. Standard errors clustered at the patent-level. \* significant at 10%, \*\* at 5%, \*\*\* at 1%.



panel presents results for our full sample of SEP assertions, while the bottom panel present results calculated using the subset of assertions by transacting PE-NPE pairs (again including PE-NPE pair fixed effects). In columns (1) and (3) of the top panel, we see that when PEs are accused of declaration-related gamesmanship or leveraging the confidential nature of prior licenses, their SEP assertions are significantly less likely to settle; by contrast, SEP assertions by NPEs are significantly more likely to settle when evidence of the same behaviors is present. In columns (2) and (4) of the top panel, we find no significant association in PE or NPE assertions between settlement and opportunistic behaviors that exploit a licensee's position on the supply chain or increase the risk of a ban on the sale or importation of the licensee's products. In the bottom panel, where we limit our sample to the assertions of transacting PE-NPE pairs, our results again suggest (broadly speaking) a generally negative association between settlement and opportunism by PEs and a generally positive correlation between settlement and opportunism by NPEs. However, here our coefficients for PE behaviors are only significant in columns (3) and (4) and no longer significant in column (1), and none of our measures of NPE behavior produce significant results.

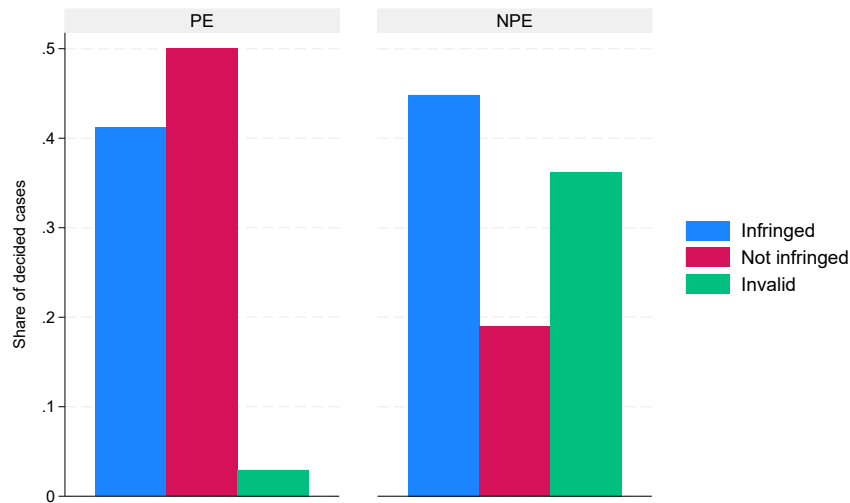
While it is difficult to interpret the mere fact that an SEP assertion settled, the distribution of outcomes in the small subset of assertions that did not settle suggests that NPEs may benefit more (and society less) when NPE SEP assertions terminate prior to a ruling on the merits. As shown below in Figure 3, we find that, while NPEs and PEs win and lose in court at comparable rates, they tend to lose for different reasons. Specifically, while PEs lose most often due to a determination that their SEPs are not infringed, NPEs tend to lose on the grounds that their SEPs are invalid. Because invalid patent claims cannot be asserted or licensed (while non-infringed claims can), invalidation generates positive externalities to a substantially greater extent as it both forecloses future lawsuits and ends prior licensees' obligation to pay ongoing royalties. With the caveat that selection effects make outcomes on the merits challenging to assess, outcomes in our sample of cases leave some room to suspect that NPE settlements in our setting are—contrary to the overall interests of those participating in the relevant product market—more likely to enable the continued assertion of likely-invalid patents.

Table 5: Opportunistic conduct &amp; settlement

| <b>All</b>          | Declaration         | Supply chain        | Market transparency  | Sales ban          |
|---------------------|---------------------|---------------------|----------------------|--------------------|
|                     | (1)                 | (2)                 | (3)                  | (4)                |
| NPE                 | 0.247***<br>(0.055) | 0.216***<br>(0.057) | 0.276***<br>(0.057)  | 0.144*<br>(0.075)  |
| Oppo. conduct       | -0.093*<br>(0.052)  | -0.040<br>(0.046)   | -0.397***<br>(0.056) | -0.060<br>(0.048)  |
| Oppo. conduct × NPE | 0.103*<br>(0.060)   | -0.011<br>(0.056)   | 0.279***<br>(0.068)  | 0.099<br>(0.063)   |
| Controls            | Yes                 | Yes                 | Yes                  | Yes                |
| Case filing year    | Yes                 | Yes                 | Yes                  | Yes                |
| R <sup>2</sup>      | 0.297               | 0.297               | 0.362                | 0.296              |
| Observations        | 1,585               | 1,585               | 1,585                | 1,585              |
| <b>PE-NPE pairs</b> | Declaration         | Supply chain        | Market transparency  | Sales ban          |
|                     | (1)                 | (2)                 | (3)                  | (4)                |
| NPE                 | 1.599*<br>(0.775)   | 1.662*<br>(0.799)   | 1.248<br>(0.813)     | 1.128<br>(0.932)   |
| Oppo. conduct       | -0.028<br>(0.060)   | 0.016<br>(0.048)    | -0.388**<br>(0.118)  | -0.186*<br>(0.085) |
| Oppo. conduct × NPE | 0.046<br>(0.055)    | -0.065<br>(0.038)   | 0.068<br>(0.133)     | 0.116<br>(0.106)   |
| Controls            | Yes                 | Yes                 | Yes                  | Yes                |
| Case filing year    | Yes                 | Yes                 | Yes                  | Yes                |
| R <sup>2</sup>      | 0.572               | 0.574               | 0.638                | 0.578              |
| Observations        | 685                 | 685                 | 685                  | 685                |

Notes: PE: practicing entity; NPE: non-practicing entity. *Oppo. conduct* denotes behavior shown in the four columns: Declaration, Supply chain, Market transparency, and Sales ban. Controls included listed in Appendix A. Unit of observation at the patent-party-case level. Standard errors clustered at (a) the patent-level in the upper-panel and (b) the PE-NPE pair level in the lower panel. \* significant at 10%, \*\* at 5%, \*\*\* at 1%.

Figure 3: Case outcomes by plaintiff type



PE: practicing entity; NPE: non-practicing entity. Unit of observation at the patent-party-case level.

## 5 Conclusion

Contrary to commentary that often paints the opportunistic tendencies of NPEs and PEs as almost binary in nature, our results suggest that both types of SEP enforcers frequently engage in behaviors that could be characterized as opportunistic in nature. Overall, we find that almost three-quarters of NPE SEP assertions and more than four-fifths of PE SEP assertions satisfy at least one of our eleven measures.

That said, our results do reveal significant heterogeneity with respect to specific opportunistic strategies that NPEs and PEs elect to pursue. Overall, PEs are relatively more likely to exploit potential licensees' position on the supply chain and to pursue orders prohibiting the sale or importation of potential licensees' products, while NPEs are more likely to enforce SEPs that were declared essential on an untimely basis, as well as to strategically withhold and reveal otherwise confidential licensing data. Moreover, our results remain heterogeneous across our measures of opportunism when we limit our sample to transacting PE-NPE pairs, as well as when we compare PE behavior to the conduct of different NPE types.

What accounts for the heterogeneous nature of our results is less clear. To at least some degree, our results likely reflect inherent differences in PEs and NPEs. This is particularly true with respect to behaviors that increase a potential licensees' risk of sales or import bans. It has long been recognized that NPEs are inherently less likely to obtain injunctive relief in U.S. patent litigation (Seaman, 2016), and thus may be less likely to plead entitlement to

that remedy for this reason alone. The ITC’s “domestic industry” requirement also places NPEs at a natural disadvantage in the pursuit of exclusion orders, and many studies have shown that NPEs are less active outside the U.S. generally, perhaps due to other procedural differences across nations’ legal systems (Love et al., 2016). Accordingly, a comparison of the rates at which PEs and NPEs pursue these behaviors may reveal more about their relative treatment under U.S. and foreign law than their relative willingness to behave opportunistically. Several additional behaviors may likewise not be perfectly comparable across PE and NPE SEP assertions. For example, the relatively high rate at which PE SEP assertions are challenged on exhaustion grounds may reflect to some extent that PEs routinely enter into broad cross-licenses with licensing partners. Similarly, the gap between the rates at which PEs and NPEs respectively leverage superior market information may be exaggerated if, as has been widely suggested, NPEs are relatively less likely to engage in pre-suit licensing negotiations. While we lack the data necessary to fully account for these differences, we note that their likely effects cut in the same direction—i.e., all appear to either inflate the opportunism of PEs or deflate the opportunism of NPEs—such that they do not call into question our findings that NPEs are relatively more likely to exploit declaration- and market-related hold-up behaviors overall and, within the subset of PE-NPE pairs, are more likely to exploit accused infringers’ position on the supply chain.

Our findings with respect to settlement may also help to explain PEs’ and NPEs’ relative strategic choices. Overall, we find that opportunism in the context of patent declaration and royalty rate demands is associated with both a higher settlement rate among NPE assertions and a lower settlement rate among PE assertions. While our data cannot explain why similar behaviors might lead to different outcomes in PE and NPE SEP assertions, our findings are consistent with the notion that some forms of opportunism generally decrease the odds of settlement in PE cases, while increasing the odds in NPE cases, and both types of SEP enforcers respond accordingly to increase their respective odds of settlement, such that those behaviors are marginally more common in NPE assertions and marginally less common among PEs.

In addition, our finding that potential licensees tend to react differently to sharp behavior by PEs and NPEs may also help explain why PEs so often transfer SEPs to NPEs for enforcement purposes. As documented in Figures 1 and 2, NPEs are active SEP licensors despite playing a limited role in standards development and, further, NPE activity in our context overwhelmingly involves the assertion of patents acquired from large operating technology companies that can and indeed do enforce their own patents in court. Viewed in combination with our settlement results, our findings are broadly consistent with the contention made in the literature on “patent privateering” that patent transfers from operating technology companies to NPEs are driven by the latter’s relative ability to exploit opportunistic behaviors to

achieve favorable settlements. At the same time, we caution that our results with respect to settlement should be interpreted with the caveat that our regression does not yield significant results when we interact NPE status and opportunism in the much smaller sample of transacting PE-NPE pairs.

Finally, from a broader policy perspective, we note that our results tend to support efforts, such as [those currently underway in the E.U.](#), to increase both SEP market transparency and the reliable, speedy identification of essential patents. As our results show, exploitation of these weakness in the SEP licensing ecosystem is both relatively more common among NPEs and associated with significant effects on both PE and NPE outcomes in our full sample (albeit with different signs).

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# Appendix

## A Appendix: Variables

In this Appendix we provide an overview of the variables used in the regression analysis:

- **P is NPE:** = 1 if the plaintiff is an NPE.
- **P is both P and D:** = 1 if the plaintiff appears as both plaintiff and defendant in our dataset of SEP court cases between 2010 and 2019.
- **D is both P and D:** = 1 if the defendant appears as both plaintiff and defendant in our dataset of SEP court cases between 2010 and 2019.
- **P upstream of D:** = 1 if the plaintiff is upstream of the defendant.
- **P and D competitors:** = 1 if the plaintiff and defendant are product market competitors.
- **D prior licensee of P:** = 1 if the plaintiff and defendant had a prior licensing agreement.
- **D technology user:** = 1 if the defendant use the infringing technology to sell something (significantly) unrelated, = 0 if the defendant sell the infringing technology.
- **Technology in component:** = 1 if the infringement substantially occurs in a component of the accused product, or the infringement occurs in some product/service that the defendant buys from an upstream vendor; = 0 if the accused product is, itself, a component.
- **P size:** 5 categories, SME (<US\$100 M rev. or <500 employees), Smaller Large (US\$1 B rev. > US\$100 M, or 4,000 > employees > 500), Medium Large (US\$10 B > rev. > US\$1 B, or 30,000 > employees > 4,000), Very Large (US\$100 B > rev. > US\$10 B, or 200,000 > employees > 30,000), Largest (> US\$100 B rev. or > 200,000 employees). Note: we include a dummy variable in our specification if *P size* is missing.
- **D size:** 5 categories, SME (<US\$100 M rev. or <500 employees), Smaller Large (US\$1 B rev. > US\$100 M, or 4,000 > employees > 500), Medium Large (US\$10 B > rev. > US\$1 B, or 30,000 > employees > 4,000), Very Large (US\$100 B > rev. > US\$10 B, or 200,000 > employees > 30,000), Largest (> US\$100 B rev. or > 200,000 employees). Note: we include a dummy variable in our specification if *D size* is missing.
- **Declaratory action:** = 1 if the case is a declaratory action as opposed to an infringement action.
- **D answer count:** count of answers filed by the defendant.
- **MTD:** = 1 if a motion to dismiss was filed.
- **MSJ:** = 1 if a motion for summary judgment was filed.

- **Case transferred:** = 1 if a case was transferred to another court or was otherwise litigated across multiple, separate case numbers due to severance, consolidation, or other procedural complexities.
- **Patent reassigned:** = 1 if the patent has been re-assigned at least once at any point between independent entities.

## B Appendix: Tables

Table A-1: Top-10 SEP asserting NPEs

| Rank       | Name                       | Type              | Share |
|------------|----------------------------|-------------------|-------|
| <b>SEP</b> |                            |                   |       |
| 1          | Acacia                     | Acquired          | 17.53 |
| 2          | Sol IP                     | Acquired          | 8.51  |
| 3          | Fineur International       | Acquired          | 4.35  |
| 3          | SPH America                | Acquired          | 4.35  |
| 4          | Princeton Digital          | Acquired          | 4.16  |
| 4          | WiLan Quarterhill          | In-house/Acquired | 4.16  |
| 5          | Interdigital               | Acquired          | 3.28  |
| 6          | FastVDO                    | Failed            | 2.83  |
| 7          | Intellectual Ventures      | In-house/Acquired | 2.64  |
| 8          | Virnetx                    | Acquired          | 2.46  |
| 9          | Neomedia                   | Acquired          | 2.33  |
| 9          | Helferich Patent Licensing | Individual        | 2.33  |
| 10         | Evolved Wireless           | Acquired          | 2.08  |

**Notes:** NPE: non-practicing entity. The table shows the share of total assertions between 2010-2019 by the top 10 asserting NPEs.